



SBIR

Small Business Innovation Research Program

ABSTRACTS OF AWARDS FOR FISCAL YEAR 2000

U.S. DEPARTMENT OF COMMERCE

INTRODUCTION

The Department of Commerce (DOC), through the Small Business Innovation Research (SBIR) program, awarded 42 Phase 1 contracts for FY 2000. These awards of up to \$75,000 each, and totaling approximately \$3.0 million, are for a six month effort to demonstrate the feasibility of innovative approaches to the research topics identified in the "DOC SBIR Program Solicitation for FY 2000 (DOC 2000-1)." Abstracts of the successful Phase 1 proposals submitted under this solicitation, and brief comments on their potential commercial applications, are provided in this publication.

In Phase 2, funding is provided for projects that are most promising after Phase 1 is completed. These awards can be for up to \$300,000 each and for two years. Phase 3 uses non-SBIR funding to pursue potential commercial applications of the project. The DOC awarded a total of 14 Phase 2 contracts in FY 2000 for a total of approximately \$4.6 million. Abstracts of successful Phase 2 proposals and comments on their commercial applications are also provided in this publication.

The SBIR program is highly competitive. A total of about 300 proposals were received by DOC in response to its FY 2000 solicitation. The proposals were independently reviewed by DOC scientists and/or engineers. With the funds available, only 42 could be selected. Final selection was based upon the results of the reviews, relative importance to DOC needs, relationship to on-going research, and potential for commercialization.

FY 2000 PHASE 1 AWARD WINNER

TOPIC: 8.1 Atmospheric Sciences

SUBTOPIC: 8.1.1W Development of Ground System that provides Real Time
Access to X Band Next Generation Satellites

TITLE: Ground System Design for Next Generation POES Satellites

FIRM: Global Imaging, Inc.
201 Lomas Sante Fe Drive
Suite 380
Solana Beach, CA 92075

PRINCIPAL INVESTIGATOR: Stephen E. Borders
858-481-5750

AWARD AMOUNT: \$75,000

ABSTRACT:

We are in an age of explosive change in the way information is collected and distributed. NOAA and the National Weather Service face the challenge of not only keeping pace with these changes but of fully utilizing these advances to provide more timely and more accurate forecasts. THE NWS must be prepared to incorporate data from the next generation of polar orbiting environmental satellites (POES) in the forecast process. Thus, there is a need for a new generation of relatively low-cost commercial ground systems that can receive data in the X-band. The principal objective of the proposed research is to evaluate the possibility of significantly reducing the cost of X-band ground systems for collecting direct broadcast data from future weather polar orbiting satellites including METOP, NPOESS, and EOS.

COMMERCIAL APPLICATIONS:

According to NESDIS estimates, there are presently 1,000 NOAA HRPT user stations worldwide. As the next generation of POES satellites are placed in orbit beginning in 2003, each ground system operator will have to upgrade their existing equipment. Global Imaging believes the worldwide market for relatively low-cost ground systems for next generation POES satellites will be approximately \$300M USD.

FY 2000 PHASE 1 AWARD WINNER

TOPIC: 8.1 Atmospheric Sciences

SUBTOPIC: 8.1.3W NOAA Weather Radio (NWR) Text Broadcast

TITLE: NOAA Weather Radio (NWR) Text Broadcast

FIRM: Hy-Tek, Ltd.
6502 Micro Drive
Dayton, MD 21036-1110

Principal Investigator: Robert M. Mroz
410-531-5111

AWARD AMOUNT: \$75,000

ABSTRACT:

Develop the concept of a sub-audible or sub-channel form of modulation that can carry at least a 9600 baud data stream on an existing narrowband FM transmitter without causing disruption to the existing audio on the carrier of that transmitter as the signal is demodulated at the receiving end of the transmission path.

COMMERCIAL APPLICATIONS:

Additional effective bandwidth to existing communications systems.

FY 2000 PHASE 1 AWARD WINNER

TOPIC: 8.1 Atmospheric Sciences

SUBTOPIC: 8.1.4R Detection of the Acoustic Airwave from Avalanches: the Basis for a New Warning System

TITLE: Infrasonic Detection of Avalanches

FIRM: Chinook Engineering
555 Absaraka
Sheridan, WY 82801

PRINCIPAL INVESTIGATOR: Ernest Scott
307-672-7790

AWARD AMOUNT: \$75,000

ABSTRACT:

An automated single microphone avalanche detection and warning system is proposed based on the sub-audible sound (infrasound) created by avalanches. Phase 1 research will demonstrate the feasibility of the concept through systematic analyses of experimental data collected from an avalanche research/release facility near Bozeman, MT.

Chinook will collect signals produced by actual avalanches measured with multiple sensor configurations. This will enable establishing the relative performance of sensors and noise filters. These measurements will be used to evaluate detection techniques, and will be used in Phase 2 to optimize the design of a prototype system.

An outstanding team and facilities have been assembled for this project. Chinook brings remote systems operation expertise to the team. The University of Wyoming's Electrical Engineering Department brings expertise in signal acquisition and analysis, digital signal processing and hardware design. Southern Methodist University brings infrasonic sensing operating expertise. Montana State University brings avalanche mechanics expertise, and offers their avalanche research and release facility.

The proposed system has the potential to significantly advance avalanche forecasting and control strategies. The advent of automated avalanche detection systems will improve emergency response capabilities, with great potential for reducing property losses and saving lives.

COMMERCIAL APPLICATIONS:

Stand-alone or networked systems that detect avalanches in nearby slide areas, warn people in the area, and alert emergency response teams.

FY 2000 PHASE 1 AWARD WINNER

TOPIC: 8.1 Atmospheric Sciences

SUBTOPIC: 8.1.5R Modernization of Aging Infrastructure in the National
Atmospheric Deposition Program

TITLE: Next Generation Precipitation Sampler for the National Atmospheric
Deposition Program

FIRM: Yankee Environmental Systems, Inc.
101 Industrial Blvd.
Turners Falls, MA 01376

PRINCIPAL INVESTIGATOR: David J. Beaubien, Sr.
413-863-0200

AWARD AMOUNT: \$75,000

ABSTRACT:

Since the early 1990s, the National Atmospheric Deposition Program has expressed a desire to upgrade the technology in its current fleet of automated precipitation samplers. These vintage-1970s samplers suffer from a number of reliability issues, as well as design problems such as unsatisfactory winter operation in cold climates. Problems range from lid freezing to motor and precipitation sensor failures to poor accuracy in windy or light precipitation conditions. In addition, new capabilities are desired that are incompatible with the current system, such as additional isolated collection vessels. This will involve adding one or more isolated collection vessels to the existing sampler, new actuators and associated control electronics. We will explore several technical approaches that will range from an entirely new sampler design to a retrofit of the existing sampler. This latter approach would help leverage the government's significant existing capital investment in the current sampler superstructure in terms of both hardware and operational maintenance experience. By not replacing the entire system we can potentially optimize funds by improving critical areas with the greatest potential for performance enhancement, such as optical precipitation sensing. Reliability improvements are a central tenet to the design and should help reduce operational costs.

COMMERCIAL APPLICATIONS:

Although not still in the public spotlight, the acid rain problem is still a major problem. The NADP program alone operates nearly 230 sites, and when all other countries such as Canada are combined, the total approaches 500 monitoring sites. A "phased replacement" of samplers represents a global market of approximately 100 systems per year over a five year period. Yankee Environmental Systems, Inc., (YES) a manufacturer of scientific instrumentation, intends to build and market these systems through its existing network of sales representatives. In addition, it is possible that some YES monitoring technology already in use by the USDA's UV-B monitoring program could be leveraged to reduce procurement costs at some sites within the NADP network.

FY 2000 PHASE 1 AWARD WINNER

TOPIC: 8.2 Ocean Observation Systems

SUBTOPIC: 8.2.3R Low-cost Transportable HF Skywave Radar

TITLE: Low-cost Transportable HF Skywave Radar

FIRM: CODAR Ocean Sensors, Ltd.
1000 Fremont Avenue, Suite 145/K
Los Altos, CA 94024

PRINCIPAL INVESTIGATOR: Donald E. Barrick
408-773-8240

AWARD AMOUNT: \$74,934.06

ABSTRACT:

We propose to provide a feasible design for a low-cost transportable HF skywave radar by focusing primarily on the greatest impediment to achieving this goal: the receive antenna subsystem. This will be accomplished by employing superdirective antenna gain principles, allowing compact arrays of fewer elements, capable of installation in a fenced field. These arrays will provide similar directive gain to much larger conventional phased arrays spanning kilometer lengths. Using our unique MATLAB optimization codes and patented HF antenna design methodology, we will obtain the best tradeoff between compact size, directive gain, and receive efficiency (for maximum S/N). Since beam forming by itself cannot provide adequate surface map resolution (e.g., 10-20km), the efficacy of direction finding (DF) will be established for the favored antenna design. The MUSIC DF algorithm used in our compact SeaSonde HF surface-wave radars will be employed. Finally, we will build, prototype and test an antenna array model under Phase 1 to validate our superdirective approach. Beyond the receive antenna subsystems, we will provide specifications and cost estimates for the remainder of the skywave radar, based on derivatives of our present commercial SeaSonde systems. The output of Phase 1 will allow the demonstration of a limited-performance version of a compact HF skywave radar under Phase 2.

COMMERCIAL APPLICATIONS:

A commercial low-cost transportable HF skywave radar could be applied to: 1) hurricane and storm observation, warning, and prediction; 2) marine services, oil spill response, search and rescue; 3) monitoring dangerous "loop currents" in the Gulf of Mexico; 4) oceanographic investigations farther removed from shore; 5) Military/defense applications for ocean environmental monitoring around the country's own shores, or to monitor regions where military activities (e.g., amphibious operations) are anticipated or underway.

FY 2000 PHASE 1 AWARD WINNER

TOPIC: 8.2 Ocean Observation Systems

SUBTOPIC: 8.2.4G Automated Ocean/Atmosphere Observations from Volunteer Observing Ships

TITLE: Automated Ocean/Atmosphere Observations from Volunteer Observing Ships

FIRM: Yankee Environmental Systems, Inc.
101 Industrial Blvd.
Turner Falls, MA 01376

PRINCIPAL INVESTIGATOR: David J. Beaubien, Sr.
413-863-0200

AWARD AMOUNT: \$75,000

ABSTRACT:

This program seeks to develop a system for Automated Ocean/Atmosphere Observations from Volunteer Observing Ships (VOS) that produce research quality data. With over 7000 ships, the VOS is integral to NOAA's National Ocean Service operations. Excepting NOAA's vessels, most VOS participants use simple, non-automated sensors such as sling psychrometers, barometers, and rain gauges. The data is logged into the Ship's Code Card, or into the INMARSAT-C transceiver. Ideally, an integrated and automated shipboard sensor and data entry system is needed, providing real-time presentations and reporting high quality data via satellite through NOAA's Shipboard Environmental (data) Acquisition System (SEAS).

With input from the NOAA's Marine Operations Program Office, we would evaluate current research instrumentation packages for specification (i.e., required level of performance), and cost (both initial and operating); and determine how cost could be reduced. A bench top system prototype would demonstrate achievement of most of these requirements.

COMMERCIAL APPLICATIONS:

If the system proved to be low cost, considerable market potential might exist for outfitting VOS ships with the sensor package. Since it will assist ships' basic navigation, ships might purchase these themselves, freeing NOAA from hardware costs. The proposed approach would result in a low cost, effective and reliable system to satisfy the VOS program needs and produce commercial components for similar applications.

FY 2000 PHASE 1 AWARD WINNER

TOPIC: 8.3 Living Marine Resources

SUBTOPIC: 8.3.1F Rapid and Sensitive Methods for the Identification of
Viral Pathogens of Shrimp

TITLE: Development of Real-Time PCR Assays for Detection of Viruses in
Penaeid Shrimp

FIRM: Super Shrimp, Inc.
1545 Tidelands Avenue
Suite J
National City, CA 91950

PRINCIPAL INVESTIGATOR: Dr. Kurt R. Klimpel
619-477-5394

AWARD AMOUNT: \$74,595

ABSTRACT:

The polymerase chain reaction (PCR) has revolutionized the detection of DNA and RNA. As little as a single copy of a particular sequence can be specifically amplified and detected. Recent advances in PCR chemistry have resulted in a technique which is considerably faster, more specific and quantitative. The exceptionally flexible SYBR Green PCR chemistry can be used to design a pathogen detection/diagnostics system ranging from a simplified, extremely rapid assay to a fully automated instrument for screening hundreds of samples daily. During this program we will identify target sequences for SYBR Green PCR chemistry from four shrimp viruses (IHHNV, TSV, WSV and YHV), create standard molecules in the form of plasmids for the diagnosis and quantitation of each target virus, design SYBR Green primers for each virus and optimize their use. Additionally we will refine methods for the rapid extraction of shrimp DNA and RNA for use in SYBR Green PCR. This Phase 1 research program will demonstrate the utility, sensitivity and specificity of this chemistry as well as prepare the reagents and standards needed to continue this work through Phase 2 and into Phase 3.

COMMERCIAL APPLICATION:

The Department of Commerce or independent companies or diagnostic laboratories will be able to set up a program for the rapid screening of shrimp and other marine commodities for viruses that are potentially damaging to U.S. shrimp production and processing industries. The work will result in detailed protocols for rapid molecular techniques that can be applied by U.S. technicians to screen, at points of entry, samples of live and frozen commodity shrimp.

FY 2000 PHASE 1 AWARD WINNER

TOPIC: 8.4 Ocean Sciences

SUBTOPIC: 8.4.2SG Aquaculture: Water Reuse and Effluent Treatment

TITLE: Catalytic Production of Ozone for Aquaculture

FIRM: Manning International Chemical Systems
202 East Cranford Avenue
Valdosta, GA 31602

PRINCIPAL INVESTIGATOR: Dr. Thomas J. Manning
912-242-7045

AWARD AMOUNT: \$49,975

ABSTRACT:

Recent work has demonstrated that the inert gas argon can be used to produce ozone in a rugged, low capital cost corona discharge unit. The conversion efficiency ($3O_2 \Rightarrow 2O_3$) and power consumption for this process are (at least!) Competitive with the best commercially available units that require a relatively large initial investment and a significant infrastructure to operate. This proposal is aimed at providing the most economical competitive process in terms of the initial investment, power cost, gas consumption and infrastructure. Using a protected idea (patent pending), we hope to convert a very interesting and promising scientific experiment into the premier method to produce and dissolve ozone in the aqueous phase for aquaculture applications. The process promises to be rugged, portable, and offer flexibility for any aqueous phase applications.

COMMERCIAL APPLICATIONS:

Economical ozone generation and application system for any aquaculture application (viral inactivation, chemical reduction, etc.) In any aqueous phase (fresh, brackish, salt, etc.)

FY 2000 PHASE 1 AWARD WINNER

TOPIC: 8.4 Ocean Sciences

SUBTOPIC: 8.4.1SG Aquaculture: Developing and Improving Species Culture

TITLE: Hatchery Production of Basket Cockles for the Mariculture Industry

FIRM: Qutekcak Shellfish Hatchery
P.O. Box 369
Seward, AK 99664

PRINCIPAL INVESTIGATOR: Jon Agosti
907-224-5181

AWARD AMOUNT: \$50,000

ABSTRACT:

This SBIR Phase 1 project will develop innovative hatchery protocols that will enable production of basket cockle (*Clinocardium nuttallii*) seedstock. Previous investigations have shown that this cockle species does not respond to standard hatchery techniques that induce gametogenesis in other species. Without a reliable supply of hatchery raised spat, mariculture operations are restricted to harvest of declining natural populations, effectively eliminating the basket cockle from significant commercial utilization. To overcome this bottleneck, QSH will conduct a focused biochemical and histological investigation of cockle reproduction to determine the feasibility of hatchery production for the Alaskan mariculture industry. Anticipated results will be gametogenic timelines, extensive biochemical analyses of gametogenesis, diet development, and a demonstration of successful spawning of hatchery-conditioned cockle broodstock.

Phase 2 will further refine the protocols with the aim of increasing gamete production and viability and expanding the project to include rearing cockle seed for several mariculture operations that will raise the spat to market size. This will allow diversification of the species under cultivation first by Alaskan farmers and later by other farmers in the Pacific Northwest.

COMMERCIAL APPLICATIONS:

Successful demonstration of basket cockle spawning in a hatchery environment is the first required step to commercial production of this species in the mariculture industry. QSH expects that the primary markets for cockle spat will initially be the Alaskan mariculture industry, with expanded production going to other Northwest operations. Cockles will ultimately compete with other bivalve species as part of an annual hard shell clam market that exceeds \$123 Million.

FY 2000 PHASE 1 AWARD WINNER

TOPIC: 8.4 Ocean Sciences

SUBTOPIC: 8.4.5SG Technology for Sampling Marine Organisms and their
Native Environment at Deep-Sea Hydrothermal Vents

TITLE: Cyclops Abyssal Benthic Sampler: (CABS)

FIRM: Cyclops Research & Development, Inc.
340 West 87th Street
New York, NY 10024

PRINCIPAL INVESTIGATOR: Richard P. Sheryll
212-874-2827

AWARD AMOUNT: \$50,000

ABSTRACT:

Cyclops proposes a solution for studying deep-sea microbial biodiversity using a patented sampling methodology and device allowing for the retrieval of uncontaminated, undisturbed deep-sea samples while maintaining ambient pressure.

The study of deep-sea microbial ecology is limited by the absence of a sampling technology that can collect and maintain sample media in the absence of decompression, and assure an uncontaminated and uncompromised sample. The solution to this is addressed by employing an innovative controllable interface between the marine environment and the sample chamber.

Phase 1 will achieve proof of design and establish and test the operating principles for the Sampler, allowing for Phase 2 building of an operational prototype. As required by the subtopic, the Cyclops technology is intended to interoperate with existing surface handling equipment - a high pressure isolation/culture chamber and a chemostat - which collectively comprises a system for the retrieval, transfer, isolation, and culturing of marine organisms, in the absence of decompression and allowing study of organisms in their natural environments.

Research objectives for Phase 1 is to test the operational elements of the design, the controllable interface between the marine environment and the sampler chamber, and motion control elements.

COMMERCIAL APPLICATIONS:

The commercial applications for the technology are supported by the rapid growth of the field of extremophiles. For example, the recent discovery that actinomycetes (a key source for antibiotics), exist at hydrothermal vents is a prime application of the technology. This study of marine actinomycetes could provide the basis for new resistant strains of antibiotics. Other commercial applications for the novel bioactive compounds to be retrieved by the Cyclops technology include enzymology, biotechnology and any other industry engaging in natural product research.

FY 2000 PHASE 1 AWARD WINNER

TOPIC: 8.4 Ocean Science

SUBTOPIC: 8.4.6SG Disease Diagnostics and Control

TITLE: CB-Sherlock - Solid-State Biochip for Toxins and Pathogens

FIRM: Biopraxis, Inc.
P.O. Box 910078
San Diego, CA 92191-0078

PRINCIPAL INVESTIGATOR: Dr. Peggy An Thompson
858-452-2413

AWARD AMOUNT: \$50,000

ABSTRACT:

Seafood toxins and pathogens cause severe health and economic problems worldwide, hindering the growth of U.S. aquaculture. CB-Sherlock is a solid-state biochip technology with a demonstrated ability to identify toxins ranging from aflatoxins to proteins, identifying each toxin that binds even when cross-reactive biomolecules are used and of exploiting a wide range of biomolecules to detect a wide range of targets. It has already been shown to be capable of detecting pathogens at the single cell level within one minute of capture by an antibody, without incubations reagents, or labels. It has the potential for analyzing dozens of toxins and microorganisms, simultaneously, in minutes. The ultimate goal is the development of a simple, flexible tool that can be used in the extremely rapid and exquisitely sensitive detection and identification of toxins, pathogens, and pesticides in complex samples such as seawater and shellfish extracts. Phase 1 will confirm predictions that the CB-Sherlock approach will be able to detect seafood toxins ranging from histamine (MW=111) to microcystin-LR (MW=995), differentiating among closely-related analogs even in aquaculture samples. The ability to use a wide range of biomolecules will also be demonstrated.

COMMERCIAL APPLICATIONS:

Rapid, inexpensive seafood disease detection makes it possible to manage captive breedstock more effectively, take prophylactic measures promptly, identify pathogen/toxin transmission routes and contamination sources, evaluate new control techniques, support development of therapeutants, simplify water certification, detect disease in live and frozen imports, and monitor contamination of processing equipment and in wastes and verify the efficacy of preventive measures. CB-Sherlock can also be used in the diagnosis of disease in humans. A CB-Sherlock system can be upgraded, simply by developing new dipsticks and tailoring the software, for many additional applications in agriculture, food and beverage safety, and clinical chemistry.

FY 2000 PHASE 1 AWARD WINNER

TOPIC: 8.4 Ocean Science

SUBTOPIC: 8.4.6SG Disease Diagnosis and Control

TITLE: Cryopreservation and Lyophilization of Live Vaccines for Aquaculture

FIRM: ProFISHent, Inc.
17806 NE 26th Street
Redmond, WA 98052-5848

PRINCIPAL INVESTIGATOR: Dr. David B. Powell
425-881-9244

AWARD AMOUNT: \$49,000

ABSTRACT:

The use of live vaccination has already become a crucially important approach to the improvement of human and livestock health (Janeway and Travers 1994, Tolud 1997). This will almost certainly also hold true for aquatic animals. This innovative project will be the first to test natural marine and polar ice cryoprotectants for their ability to enhance the survival and stability of attenuated vaccines for aquatic animals. Although new live vaccines for aquatic species have been invented in recent years, the technology needed for commercialization is still in its infancy. For live vaccines to be economical, the organisms must survive long enough in sufficient numbers to stimulate protective humoral and especially cellular immune responses. *Flavobacterium columnare* bacteria and infectious hematopoietic necrosis virus (IHNV) will be used as model organisms to evaluate the feasibility of our technical approach.

COMMERCIAL APPLICATIONS:

Phase 2 and 3 developments of this technology will produce a new generation of aquaculture vaccines that will substantially reduce losses to disease. These live products can be readily applied to animal stages too small to inject. The lack of adverse effects to biological filters will be an added benefit. It should be possible to vaccinate and raise a variety of aquatic species previously thought to be too susceptible to pathogens.

FY 2000 PHASE 1 AWARD WINNER

TOPIC: 8.5 Cartography, Photogrammetry, Hydrography, and Geodesy

SUBTOPIC: 8.5.40 GPS Antenna for Geodesy and Navigation

TITLE: GPS Antenna for Geodesy and Navigation

FIRM: NAVSYS Corporation
14960 Woodcarver Road
Colorado Springs, CO 80921-2370

PRINCIPAL INVESTIGATOR: Alison K. Brown
719-481-4877

AWARD AMOUNT: \$75,000

ABSTRACT:

GPS is extensively used, by both the government and the private sector, for high accuracy geodetic and navigation applications. GPS carrier phase relative positioning techniques are now the mainstay of the survey community. The precision of GPS relative positioning or kinematic GPS (KGPS) solutions is a function of the accuracy of the carrier-phase observations provided by a GPS receiver. These are dominated by multipath errors caused by reflected signals received from nearby surfaces. Multipath often contributes over 2 cm of error to the observed carrier phase.

The only current effective approach to reduce the multipath errors on the carrier phase observations is to use an antenna designed to cut off signals from below the horizon. This can be accomplished by using a large ground-plane or by installing a choke-ring around the antenna element. Our proposed approach to address this problem is to use beam-steering to provide gain in the direction of the desired satellite signals (upwards) while attenuating signals from undesired directions (downwards). NAVSYS has already developed a digital beam steering GPS antenna array as a commercial product. We propose to leverage this product to develop a beam-steering antenna array suitable for geodesy and navigation under this SBIR effort.

COMMERCIAL APPLICATIONS:

Applications for the phased array antenna exist in the civil and government surveying and geodetic communities. The improved carrier phase accuracy will also benefit kinematic GPS applications. These include precision farming, autonomous navigation of vehicles (e.g. mining applications), and precision guidance. The proposed antenna array will also have applications in the JPALS and LAAS programs to improve the performance and reliability of GPS observations for aircraft precision approach and landing.

FY 2000 PHASE 2 AWARD WINNER

TOPIC: 8.1 Atmospheric Sciences

SUBTOPIC: 8.1.1A Low-Cost Rugged Pressure Sensors for Large-Scale
Deployment in Tornado Prone Areas

TITLE: A Hardened In-Situ Tornado Pressure Recorder

FIRM: Applied Research Associates, Inc.
5941 S. Middlefield Road, Suite 100
Littleton, CO 80123

PRINCIPAL INVESTIGATOR: Tim Samaras
303-795-8106

AWARD AMOUNT: \$298,377

ABSTRACT:

This effort uses an innovative approach of a low cost pressure probe that was designed and constructed in a Phase 1 effort to address the difficult measurement problem of obtaining pressure signatures from the passage of tornado cores. A prototype "Hardened In-Situ Tornado Pressure Probe" (HITPR) was preliminarily tested and found to be in excellent agreement with the pressure probe previously described.

Phase 2 of this effort will focus on continued testing and fielding of the prototype HITPR probe. The results will refine the construction of eight pre-production deliverable HITPR units. The eight HITPR units will be used by chase teams for large-scale deployments for final testing and recording of the pressures associated with tornado cores. The results will be compared with the tornado wind speeds measured in the field.

COMMERCIAL APPLICATIONS:

It is envisioned that hundreds, even thousands of these probes will be deployed in tornado prone areas across the United States. Potential customers would be the government, private weather firms, and the insurance industry.

FY 2000 PHASE 2 AWARD WINNER

TOPIC: 8.2 Ocean Observation Systems

SUBTOPIC: 8.2.5A High Resolution Hyperspectral System for Rapid Coastal Marine Geophysical Data Acquisition and Processing

TITLE: High Resolution Hyperspectral System for Coastal Mapping and Feature Extraction

FIRM: Advanced Power Technologies, Inc.
1250 24th Street, NW
Washington, D.C. 20037

PRINCIPAL INVESTIGATOR: Dr. John Antoniadis
202-223-8808

AWARD AMOUNT: \$299,549

ABSTRACT:

The objective of this Phase 2 is the fabrication, assembly, integration, and testing of an end-to-end airborne hyperspectral system optimized for imaging and mapping of the coastal environment. The system design, as developed in the Phase 1 report, integrates an autonomous data acquisition system with a spectral processing system on a PC based workstation for the rapid detection, discrimination, and quantification of components affecting water quality, and bottom type. The designed system is based on currently available technology and on new components and software features, which are optimized to address the requirements of the coastal environment.

The design of the autonomous hyperspectral imaging system incorporates several technical improvements dealing with real-time image display, geo-registration, sensor signal-to-noise performance, radiometric calibration, and software enhancements. The proposed imaging system improvements are specifically tailored to meet the coastal mapping requirements but they also provide an enhanced capability for general-purpose imaging. The system design provides the specification for system component identification and optimization.

COMMERCIAL APPLICATIONS:

Hyperspectral imaging systems have a number of commercial applications both in the microscopic and in the macroscopic scale. Major proven applications of airborne imaging include mineral exploration, environmental pollution monitoring, precision farming, vegetation stress monitoring, infrastructure, and urban area planning.

FY 2000 PHASE 2 AWARD WINNER

TOPIC: 8.2 Ocean Observation Systems

SUBTOPIC: 8.2.7A Ship Motion Measurement System Utilizing a
GPS/IMU System

TITLE: GPS/Inertial Ship Motion Measurement System

FIRM: Seagull Technology, Inc.
16400 Lark Avenue
Los Gatos, CA 95032

PRINCIPAL INVESTIGATOR: John Wilson, Ph.D.
408-358-7100

AWARD AMOUNT: \$300,000

ABSTRACT:

Seagull Technology has developed GPS / Inertial attitude systems for marine, aviation and ground vehicle applications. Prototypes have proven precise and reliable in demanding sea trials and flight tests. During Phase 1 we established the feasibility of merging the multi-antenna techniques developed for previous prototypes with a powerful innovation for GPS-aided attitude determination (patent pending). The resulting Ship Motion Measurement System (SMMS) will provide 16 states of highly precise motion information, including heading, pitch and roll; rotation rates; position; velocity; acceleration and time. During Phase 2 we will develop the SMMS into a rugged, low-cost precision motion sensor suitable for widespread use on vessels of all sizes, moored and drifting buoys and other platforms.

COMMERCIAL APPLICATIONS:

The GPS / Inertial Ship Motion Measurement System and follow-on products will serve vehicle sensing and control applications in numerous market segments.

FY 2000 PHASE 2 AWARD WINNER

TOPIC: 8.4 Ocean Science

SUBTOPIC: 8.4.5SG Sensors Technology for Measuring and Detecting Microbiota in Water

TITLE: Automated Instrument for RNA-based Identification of Marine Microorganisms

FIRM: TACAN Corporation
2330 Faraday Avenue
Carlsbad, CA 92008

PRINCIPAL INVESTIGATOR: Jeffrey T. Ives
760-438-1010

AWARD AMOUNT: \$199,890

ABSTRACT:

Marine pathogens have significant health and regulatory impacts on fisheries and aquaculture operations. While commercial suppliers, researchers, and regulators would benefit from improved methods, current testing is primarily limited to relatively slow and non-specific culture-based assays. This Phase 2 continues development of a fieldable, automated instrument for nucleic acid-based identification of microbial species. During Phase 1, the nucleic acid target, 16S ribosomal RNA, was shown to be species and strain specific. Phase 1 experiments also successfully demonstrated rapid, approximately 5 minute, lysis of *Escherichia coli* and hybridization of 16S rRNA to complementary oligonucleotides. Phase 2 will advance the project by developing a prototype instrument and demonstrating its operation on a variety of samples containing *E. coli* and other Gram negative bacteria.

COMMERCIAL APPLICATIONS:

The species identifier would be a significant benefit to state and federal health regulators, fisheries researchers, and businesses such as fisherman and markets involved in the distribution of marine fish and shellfish. The primary advantages offered by this technology are lower cost, more rapid results, and species-specific identification.

FY 2000 PHASE 2 AWARD WINNER

TOPIC: 8.4 Ocean Science

SUBTOPIC: 8.4.5SG Sensor Technologies for Measuring and Detecting
Microbiota in the Water

TITLE: A Method to Aid in the Prevention of Ciguatera Fish
Poisoning

FIRM: Oceanit Test Systems, Inc. (Oceanit)
1001 Bishop Street, #2970
Honolulu, HI 96813

PRINCIPAL INVESTIGATOR: Joanne S.M. Ebesu, Ph.D.
808-531-3017

AWARD AMOUNT: \$139,000

ABSTRACT:

The goal of the project is to prevent human illness due to ciguatera toxins by creating an innovative method to detect these harmful toxins in fish before human consumption. The new method will enable rapid, inexpensive, and possibly quantitative detection of ciguatera toxins suitable for large-scale testing. Phase 2 research will refine and create prototypes of the collection device (Cigua-Dart) and detection system defined in Phase 1. The technique will be appropriate for large-scale screening of suspected fish species from endemic ciguatera areas by commercial fisheries. The ciguatoxin detection system would be accessible and easily operated by laymen as well as technical personnel.

COMMERCIAL APPLICATIONS:

The markets for such systems would include ciguatera-endemic areas such as Hawaii, Florida, Guam, the Philippines, Japan, and the Caribbean; countries importing seafood from these areas; commercial fisheries; and diagnostic laboratories.

FY 2000 PHASE 2 AWARD WINNER

TOPIC: 8.4 Ocean Science

SUBTOPIC: 8.4.7SG Alternative Technologies to Ballast Water Exchange

TITLE: Electrochemically Generated Ozone for On-Board Control of Nonindigenous Invasive Species in Ballast Water

FIRM: Lynntech, Inc.
7610 Eastmark Drive, Suite 202
College Station, TX 77840

PRINCIPAL INVESTIGATOR: Dr. Thomas D. Rogers
409-693-0017

AWARD AMOUNT: \$200,000

ABSTRACT:

In Phase 1, the mobility process capabilities and potential for adaptation to on-board use were successfully demonstrated in a field test. The positive results of the Phase 1, combined with recommendations made by marine consultant and the need to expand the information base concerning safety, corrosion, ship design and integration, and system cost will be the focus of Phase 2. Lynntech will conduct tests on use of super-ozonated (i.e., 50-100 ppm) and corrosion testing to answer key technical questions while a marine engineering subcontractor will evaluate safety, ship design and integration, and other on-board considerations. The Phase 2 results will enable industry representatives to evaluate this technology for its potential as an alternative ballast water treatment technology.

COMMERCIAL APPLICATIONS:

Electrochemically generated ozone has both technical and physical process features not available through use of the corona discharge method. These features permit a significant opportunity for adaptation to on-board ballast water treatment.

U.S. DEPARTMENT OF COMMERCE
PHASE ½ AWARDS BY STATE

STATE	FY96	FY97	FY98	FY99	FY00	TOTAL
						FY85-00
AK	0/1	0	0	0	1/0	2/1
AL	2/1	0/1	3/0	0/2	0	8/4
AR	0	0	0	0	0	0
AZ	0	0	0	0	0	2/0
CA	7/5	6/5	7/2	13/3	11/4	90/38
CO	1/1	2/1	1/1	0/1	1/1	19/10
CT	0/1	2/0	0/1	1/0	2/0	13/6
DC	0	0	0	1/0	0/1	1/1
DE	1/0	0	0	0	0	1/0
FL	0	0	1/0	2/1	0/1	9/2
GA	0	1/0	0	0	1/0	2/0
HI	0/1	1/0	3/1	1/1	0/1	7/4
IA	0	0	0	0	0	0/0
ID	0	1/0	0	0	0	1/0
IL	0/1	1/0	0	0	0	6/4
IN	1/0	0/1	0	0	0	1/1
KS	1/0	0	0	0	0	1/0
KY	0	0	0	0	0	0
LA	0/1	1/0	1/1	0	0	5/2
MA	11/3	4/5	6/0	4/2	3/1	64/24
MD	2/0	6/1	6/2	3/1	3/1	39/7
ME	0	0	1/0	1/0	1/0	3/0
MI	0	3/0	1/0	1/1	1/0	9/2
MN	1/0	4/0	2/0	0/1	2/0	13/1
MO	0	0	0	2/0	0	5/0
MS	0	0	0	0	1/0	3/1

STATE	FY96	FY97	FY98	FY99	FY00	TOTAL
						FY85-00
MT	0	0	0	0	1/0	1/0
NC	0	0	0	0	0	1/0
ND	0	0	0	0	0	0
NE	0	0	0	0	0	0
NH	0	1/0	0	1/0	0	4/2
NJ	2/0	2/0	1/1	1/1	0/1	11/6
NM	1/1	5/1	0/2	1/0	0	14/6
NV	0	0	0	0	0	2/1
NY	4/1	3/3	2/1	0	2/0	22/7
OH	1/1	4/0	1/1	0	1/0	10/3
OK	0	2/0	0	0	0	2/0
OR	0	0	1/0	0	2/0	5/0
PA	2/0	0	0	2/0	2/1	9/1
PR	0	0	0	0	0	0
RI	0	0	0	1/0	0/1	1/1
SC	0	0	0	0	0	0
SD	0	0	0	0	0	0
TN	0	0	0	0	0	0
TX	0/1	2/0	3/0	3/1	1/1	13/5
UT	0	0	0	0	0	0
VA	0	4/0	5/2	½	2/1	30/11
VT	0	1/0	0	0	0	1/0
WA	1/2	6/1	0/4	0	3/1	20/9
WI	0	0	0	1/0	0	2/0
WV	0	0	0	0	0	0
WY	0	1/0	0	0	1/0	2/0
Totals	38/21	63/19	45/19	40/17	42/16	454/162